AN ECOLOGICAL AND TAXONOMIC INVESTIGATION OF *PEROMYSCUS MANICULATUS SERRATUS* IN IDAHO

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Abstract.— Twenty-two sites in central Idaho were sampled to determine the geographic range of *Peromyscus maniculatus serratus*. Isolating mechanisms which exist between the *P. maniculatus* subspecies of region require further investigation.

While trapping in central Idaho during 1936, William B. Davis recorded a race of deermouse consistently exhibiting characteristics unlike those of other subspecies found in that region. Although this new population was located geographically between the range of *Peromyscus maniculatus artemisiae* to the east, west, and north and *P. m. sonoriensis* to the south, it did not appear to be the result of intergradation between these latter populations. Consequently, Davis (1939) described a new subspecies which he named *P. m. serratus*. Davis sampled primarily near the Sawtooth and Challis regions, leaving largely unknown the extent of the range of the subspecies. Boundaries were hypothesized to extend north to the Salmon River. Little indepth study of *P. m. serratus* was conducted after the conclusion of this initial description.

In 1975, it was noted that the subspecies of deermouse found at the University of Idaho Wilderness Research center located on Big Creek in the Idaho Primitive Area appeared to be *P. m. artemisiae* (Elliott 1976). Because Big Creek is approximately 30 miles south of the Salmon River, this finding hinted that the range of *P. m. serratus* might be significantly reduced from the range suggested by Davis and illustrated by Hall and Kelson (1959). The present investigation was undertaken to determine the range of *P. m. serratus* and to identify, if possible, the factors of selection that preserve the integrity of the gene pools of the three subspecies.

Twenty-two sites in the vicinity of the expected range of *P. m. serratus*, including the approximate locations of the four trapping sites used by Davis in 1936, were sampled (Fig. 1). A tail to head and body mean ratio of 92 percent combined with prominent white subauricular patches were the best external field marks that could be used to identify adult *P. m. serratus*. The subspecies *P. m. artemisiae* has a tail to head and body mean ratio of 80 percent and faint or absent subauricular patches, while *P. m. sonoriensis* has a comparatively small tail to head and body mean ratio of 73 percent and possesses small white subauricular patches.

Average body and cranial measurements of the three *P. maniculatus* subspecies found in Idaho are shown in Table 1. It shows that *P. m. serratus* exhibits a longer total length, longer tail and larger hind feet and ears than either *P. m. artemisiae* or *P. m. sonoriensis*. The skull of *P. m. serratus* averages larger, with the cranial portion appearing to be slightly more inflated when compared to skull measurements of *P. m. artemisiae* and *P. m. sonoriensis* from neighboring sample areas and those given by Osgood (1909). Bacular measurements of adult *P. m. serratus* averaged longer than either *P. m. artemisiae* or *P. m. sonoriensis*

Secondary intergradation (Mayr et al. 1953) appears to have occurred at Station 22 between *P. m. serratus* and *P. m. sonoriensis*. as an entire spectrum of traits of both subspecies were found. At Stations 10 and 16 the specimens indicate *P. m. artemisiae*. The other 18 trapping stations exhibit a uniform set of traits characteristic of

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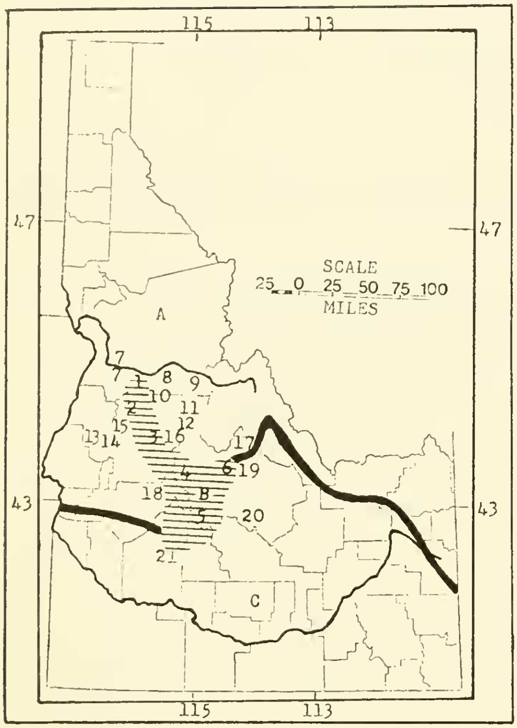

Fig. 1. Distribution of deer mouse subspecies in Idaho: (a) *Peromyscus maniculatus artemisiae*, (b) *Peromyscus maniculatus serratus*, (c) *Peromyscus maniculatus sonoriensis*.

one subspecies, as is illustrated by tail to head and body ratios of the data collected in this study (Table 2). A comparison of measurements of *P. m. serratus* from my study with the expected tail to head and body mean ratio of 92 percent reveal the difference to be nonsignificant ($X^2 = 2.36$, 3df., $.8 > P > .5$). Comparisons of difference between *P. m. artemisiae* measurements from my study to the expected ratio mean of 80 percent ($X^2 = 2.75$, 5df., $.8 > P > .5$) and my *P. m. sonoriensis* data with its expected ratio mean of 73 percent ($X^2 = 3.80$, 1df., $.1 > P > .05$) also proved to be nonsignificant.

With the range of *P. m. serratus* thus established a number of pertinent questions arise. Foremost of these is what parameters are serving to maintain the subspecies *P. m. serratus*? Cover and overstory vegetation were measured and recorded using the line intercept method (Smith 1973) at each trapping site. Where *P. m. serratus* and *P. m. sonoriensis* ranges meet an apparent boundary is provided because *P. m. sonoriensis* is found primarily in sagebrush and bunchgrass associations and *P. m. serratus* remains on the forested hillsides and creekbottoms.

No gross vegetational factors were found to deliniate a range separation where *P. m.*

TABLE 1. Body and cranial measurements of *P. maniculatus* specimens. Assignment of specimens to subspecies was based primarily on tail to head and body ratios as well as body markings.

Measurements in millimeters	*P. m. artemisiae* X̄	C.L.[2]	*P. m. serratus* X̄	C.L.	*P. m. sonoriensis* X̄	C.L.	Intergrades[1] X̄	C.L.
Total length	170.5	(167.8-173.2)	183.4	(181.0-185.8)	170.1	(166.2-174.0)	167.8	(164.2-171.2)
Tail length	76.1	(74.3-77.9)	87.4	(86.0-88.8)	72.8	(70.9-74.7)	74.3	(72.3-76.3)
Hindfoot length	21.0	(20.7-21.3)	23.4	(23.2-23.6)	20.6	(20.3-20.9)	21.6	(21.1-22.1)
Ear length	18.9	(18.4-19.4)	22.8	(22.5-23.1)	17.8	(17.2-18.4)	20.5	(19.9-22.1)
Ratio, tail:head and body	80.3	(78.6-83.0)	91.0	(89.5-92.5)	74.9	(73.3-76.5)	79.5	(76.7-82.3)
Zygomatic breadth	13.1	(12.9-13.3)	13.4	(13.2-13.6)	13.4	(13.2-13.6)	13.3	(13.1-13.5)
Occipital-nasal length	26.4	(26.1-26.7)	27.0	(26.7-27.3)	26.6	(26.2-27.0)	26.7	(26.3-27.1)
Cranium breadth	11.2	(11.0-11.4)	10.9	(10.7-11.1)	11.0	(10.9-11.1)	11.0	(10.9-11.1)
Maxillary tooth row length	3.9	(3.7-4.1)	3.9	(3.8-4.0)	3.8	(3.7-3.9)	3.9	(3.8-4.0)
Incisor-maxillary diastema	7.4	(7.2-7.6)	7.1	(7.0-7.2)	6.9	(6.7-7.1)	7.2	(7.0-7.4)
Palate length	4.2	(4.0-4.4)	4.0	(3.9-4.1)	4.3	(4.2-4.4)	4.3	(4.1-4.5)
Incisive foramen length	5.9	(5.8-6.0)	5.9	(5.8-6.0)	5.5	(5.3-5.7)	5.8	(5.6-6.0)
Post-palital length	9.7	(9.5-9.9)	9.6	(9.4-9.8)	9.2	(9.0-9.4)	9.4	(9.2-9.6)
Interorbital constriction	4.0	(3.9-4.1)	4.2	(4.1-4.3)	3.9	(3.8-4.0)	4.1	(4.0-4.2)
Nasal length	11.5	(11.3-11.7)	11.0	(10.8-11.2)	10.8	(10.6-11.0)	11.0	(10.8-11.2)
Baculum length	8.7	(8.5-8.7)	10.9	(10.6-11.2)	8.4	(7.8-9.0)	9.0	(8.0-10.0)

[1]Assumed intergrades P. m. serratus × P. m. sonoriensis taken at trapping Site 22 (Fig. 1).
[2]Confidence limits at the 95 percent confidence level.

artemisiae and *P. m. serratus* ranges meet. Further investigation of such factors as geographic barriers, climatic patterns, and soil types offered no solution. One environmental factor was discovered to have a high correlation with the range of *P. m. serratus*, that being an isobar illustrating the average date (30 June) of the last killing frost (Yearbook of Agriculture 1941).

An apparent discrepancy between this frost date isobar and the range of *P. m. serratus* appears in the eastern portion of the range approaching Challis, Idaho. However, since no weather data of this nature are available from that area the frost line could in fact include this drainage in question. Another one of many possibilities is that *P. m. serratus* is a glacial remnant, having survived that geologic time period through isolation in the rugged terrain of the Sawtooth Mountains. Physical, physiological, and behavioral barriers to breeding between *P. m. artemisiae* and *P. m. serratus* should be investigated. Until the isolating mechanisms between these gene pools is identified, the subspecific ranking of *P. m. serratus* will remain in doubt. Further research, investigating these and other aspects, would certainly be a warranted step to gaining a fuller knowledge of this restricted member of North American fauna.

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Table 2. Average ratios (expressed as percent) of tail to head and body measurements of all adult *P. maniculatus* specimens from 22 trapping sites in central Idaho.

Site number	Sample area	Sample size	Mean Ratio (percent) of tail to head and body
	Peromyscus maniculatus serratus		
1	30 mi. E. of Burgdorf	5	89.6
2	20 mi. E. of McCall	5	94.0
3	9 mi. E. of Warm Lake	12	93.5
4	5 mi. W. of Cape Horn	8	88.2
5	14 mi. W. of Challis	11	90.5
6	Alturus Lake	5	89.0
	Total	46	91.0
	Peromyscus maniculatus artemisiae		
7	10 mi. E. of Riggins	10	82.3
8	Chamberlain airstrip	11	80.0
9	Cold Meadows airstrip	10	83.9
10	Big Creek airstrip	3	84.6
11	Taylor Ranch-Cliff Creek	21	78.5
12	Taylor Ranch-Rush Creek	19	77.5
13	Flying "B" airstrip	1	79.1
14	18 mi. W. of Donnelly	15	79.5
15	5 mi. W. of Donnelly	10	81.8
16	8 mi. N.E. of Donnelly	4	84.7
17	Indian Creek airstrip	8	83.1
18	Alder Creek—25 mi. N. of Challis	12	79.2
19	5 mi. W. of Lowman	15	80.1
	Total	139	80.3
	Peromyscus maniculatus sonoriensis		
20	9 mi. W. of Challis	8	73.8
21	18 mi. N.E. of Sun Valley	14	75.5
	Total	22	74.9
	Secondary intergradation of *P. m. serratus* with *P. m. sonoriensis*		
22	3 mi. N. of Pine	19	79.5

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LITERATURE CITED

DAVIS, W. B. 1939. The recent mammals of Idaho. pp. 288–293. Caldwell, Idaho: Caxton Printers, Inc.

ELLIOTT, C. L. 1976. The effect of altitude upon various physical and reproductive factors in a population of *Peromyscus maniculatus*. Undergraduate research report, Student Wilderness Study Program. 13 pp. Unpublished manuscript.

HALL, E. R., AND K. R. KELSON. 1959. The mammals of North America II: 612–624. New York: Ronald Press Co.

MAYR, E., E. G. LINSLEY, AND R. L. USINGER. 1953. Methods and principles of systematic zoology. New York: McGraw-Hill Book Co. 328pp.

OSGOOD, W. H. 1909. Revision of the mice of the American genus *Peromyscus*. N. Amer. Fauna 28:1–285.

SMITH, R. L. 1974. Ecology and field biology. pp. 695–696. New York: Harper and Row Pub.

U.S. DEPARTMENT OF AGRICULTURE. 1941. Yearbook of agriculture: climate and man. pp. 829–840. Washington D.C.: United States Government Printing Office.